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PAPERS

IN

MECHANICKS.

MECHANICKS.

In the Year 1779, *a Bounty of Twenty Guineas was given to* Mr. ROBERT SAMPSON, *of* Petty France, Weſtminſter, (*ſee the* IId. *Vol. of the Tranſactions, page* 186,) *for his Invention of a Chime Clock, of which a Print and Deſcription is here publiſhed.*

SIR,

I BEG the favour of you to lay the incloſed letter and drawing of a Clock, before the gentlemen of the Society at their next meeting; and am, Sir,

Your humble ſervant,

ROBERT SAMPSON.

Petty France, Weſtminſter,
Nov. 23d, 1779.

Mr. MORE.

My Lords and Gentlemen,

PERMIT me to lay before you, my firſt attempt towards the improvement of Chime Clocks, which if it meets with your approbation, I am willing it ſhall be made public, as I am certain it will be of general uſe; for by this method, Chime Clocks, either of the ſpring or weight kind, may be made much cheaper than by the common methods now in uſe, and yet will perform all the ſame buſineſs, and may be made, to all outward appearance, in every reſpect the ſame.

It is an eſtabliſhed maxim in mechanicks, that the more ſimple any machine can be made, the better it is for uſe. On this principle alone I am willing to reſt the merit of my performance, being certain there is one third part of the work excluded from the internal ſtructure of this Clock, which is abſolutely neceſſary in the preſent methods of making Chime Clocks, now in uſe; and this will at leaſt ſave one third of the expence in making, which I hope is an object worthy of conſideration both to the merchant and the mechanick.

I beg leave to obſerve, that whoever examines the mechaniſm of this Clock in an impartial manner, muſt confeſs that the ſame duty can be as ſafely performed by one train of wheels in this as it can by two trains of wheels in the common method; becauſe, in this Clock, the wheels of communication are puſhed into their place before the Clock gives warning; and that warning makes it ſafe, for the locking cannot drop into its place again, therefore the Clock muſt chime and ſtrike: but in common Chime Clocks the uſual way of diſcharging the Chime is by a flirt, which in many inſtances has been known to fail.

I have already made a Clock on the before-mentioned principles; and as a view of it will convey a clearer idea than any deſcription I can give, I am willing to attend with it myſelf, when agreeable, and beg leave to ſubſcribe myſelf, with all due reſpect,

MY LORDS AND GENTLEMEN,

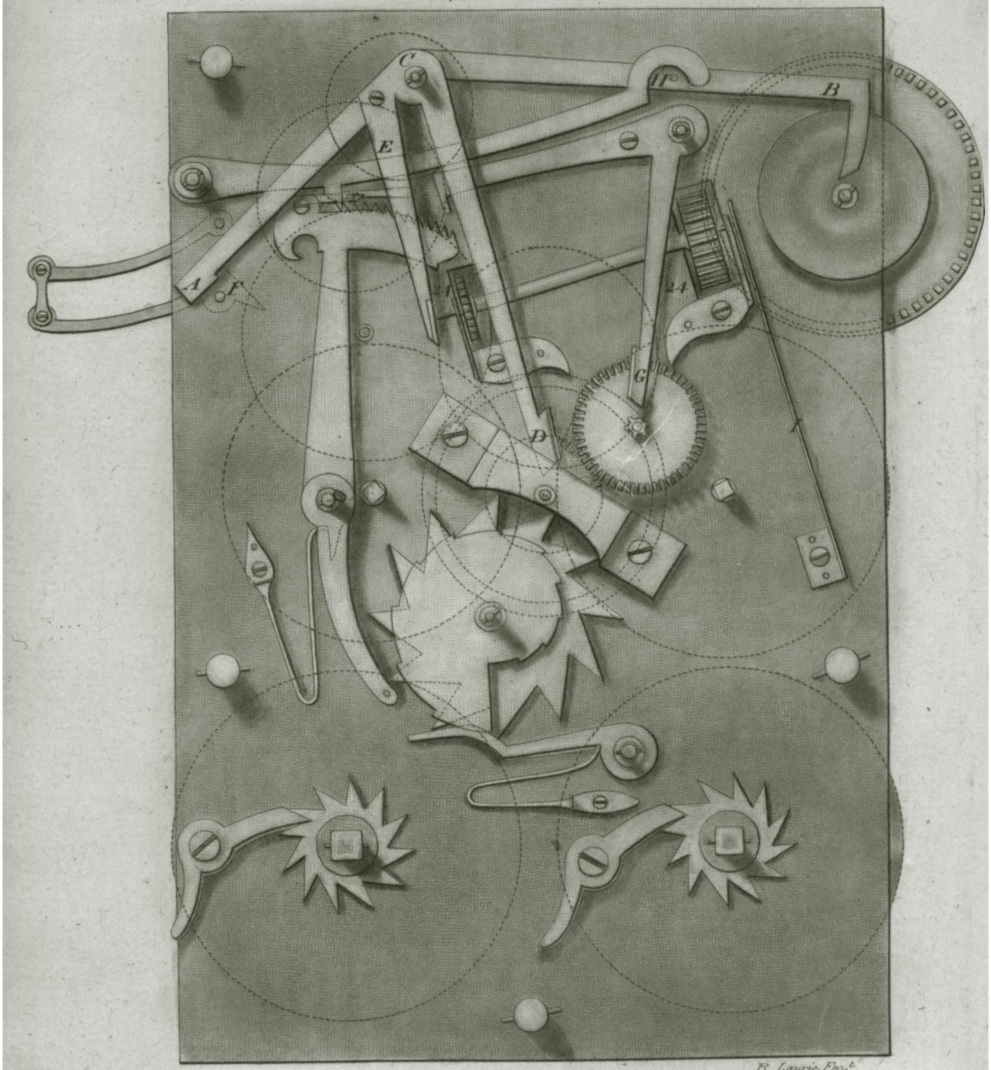
Yours to command,

ROBERT SAMPSON.

Ship Court, Petty France,
Weſtminſter, Nov. 23d,
1779.

To the Society for Encouragement of Arts, &c.

Mr. Sampson's Chime Clock.



R. Laurie Fec.t

DESCRIPTION
OF THE
TWO-PART CHIME CLOCK

Invented by ROBERT SAMPSON,

Ship Court, Weſtminſter.

THE pieces A, B, D and E, all move together on the center C: the wheels of communication marked 24 each, are both on one arbor, and commuuicate motion from the pin wheel in the ſtriking trane to the chime barrel. When the pin in the minute-wheel begins to lift the piece D, conſequently the piece E will puſh the wheel 24. into the teeth of the pin-wheel now at reſt before the Clock gives warning. Alſo B will be lifted out of the locking plate, and A will be moved over the Detent on which is the hammer tail F, and thereby pump it off the pins in the pin-wheel, and prevent it from ſtriking the hour bell while the muſic is playing. When the rack is diſcharged, and the warning piece G has dropped off the pin in the other minute-wheel, the ſtriking train will be in motion, and turn the chime barrel, which while it is playing, the pin at H prevents the hook from gathering up the rack.

When the chime has done playing, the ſmall ſpring I puſhes the wheels 24. out of the teeth of the pin wheel; and the pieces A, B, D, and E, return into the places as preſented in the callipers, and then the Clock ſtrikes the hour.

In conſequence of the following Letters and Certificates, two Guineas were adjudged to Mr. ALEXANDER MITCHELL, *and two Guineas to Mr.* ROBERT ANDERSON; *being Premiums offered for taking Whales by means of the Gun Harpoon, in* 1784.

SIR,

THE bearer was Harpooner in the Earl of Chatham, Captain Brown, of which I am part owner. By the Certificate which he brings, you will find they killed one fiſh out of five, with the Gun I ſent to the Society laſt year, having in it one of my Harpoons.

Out of three ſhips, we loſt one, viz. the Achilles; the other two were were ſucceſsful. The Gun Harpoons were uſeful in two or three other inſtances; but this was the only fiſh firſt ſtruck with a Gun Harpoon.

I am, SIR,

Your very humble ſervant,

NATHANIEL JARMAN.

Diſtaff Lane,
Nov. 4, 1784,

Mr. MORE.

London, Nov. 1, 1784.

THIS is to certify that Alexander Mitchell was an Harpooner on board the ſhip Earl of Chatham, of London, William Brown commander, to Davis's Straits, the laſt ſeaſon: and on the 18th day of June, in the latitude of 73° N. and longitude of 53° W. from London, the ſaid Alexander Mitchell ſhot a fiſh with a Gun-Harpoon, at the diſtance of ten fathom: the Gun of the Blunderbuſs conſtruction, loaded with four common Tobacco-pipes of glazed powder. The Harpoon went into the fiſh's back, up to the ring. By the aſſiſtance of the other boats, the fiſh was killed in about one hour.

WILLIAM BROWN,
Commander of the ſhip Earl Chatham.

By the following Letter, it appeared that ROBERT ANDERSON, *Spikeneer of the Achilles, which was caſt away on the Leman and Owey, on the 4th of March,* 1784, *and who was picked up by the Mary Ann, Captain* CHARLES PATTERSON, *killed a Whale by the Gun-Harpoon, in the Year* 1784.

Nov. 14, 1784.

SIR,

THE bearer, Robert Anderſon, fired a Gun-Harpoon, on the 8th of June laſt, in Greenland, at the diſtance of twelve fathom, and killed a fiſh in half an hour. I ſuppoſe the Gun-Harpoon to have been the cauſe of our killing that fiſh, which was eight foot ten inches bone.

I am, SIR,
Your humble ſervant,
CHARLES PATTERSON.

Mr. MORE.

AN eaſy and effectual method of preventing the many fatal accidents with which the uſe of the Walking-wheel Crane is attended, has long been conſidered, both by the Publick and the Society, as highly deſerving the Attention of able Mechanicks; and in the year 1762, the Society voted their Gold Medal to the late Mr. Pinchbeck, for his contrivance to anſwer that purpoſe: this was intended to be accompliſhed by a pair of Bellows, which, when the motion of the Wheel becomes greatly accelerated, throws up a catch, and ſtops the whole Machine.

This contrivance, at a conſiderable expence to the Society, was added to one of the Cranes on the Quays below London Bridge; and although it anſwered well the purpoſe it was deſigned for, yet, from that unaccountable inattention to their ſafety which is daily ſeen among labouring people, it has been ſuffered totally to fall into ruin; but a complete model ſtill remains in the Society's Repoſitory.

The decay which the leather of the Bellows is unavoidably ſubject to, has ever been a great objection to that method of ſtopping Cranes; and the thought of performing the ſame buſineſs by the centrifugal force with which a ball is thrown off when the motion is much accelerated, as ſhewn in Mr. Bunce's Model, which alſo remains in the Society's Repoſitory, is ſo well founded, executed at a ſmall expence, and at the ſame time ſo certain in its operation, and not liable to be diſordered, that it is hoped it will be adopted by thoſe perſons who have the conſtruction of ſuch Machines, and prove an effectul remedy againſt thoſe evils that have hitherto attended the uſe of the Walking-wheel Crane.

It appeared, on due examination of the Model alluded to in the following Letter, that the method of ſtopping Cranes by means of a Ball (inſtead of the Bellows uſed in Mr. Pinchbeck's Model) is new and an improvement.

The Model therefore preſented by Mr. Bunce, was accepted, and ordered to be carefully preſerved in the Society's Repoſitory, and the Silver Medal voted to Mr. Bunce, for this ingenious improvement.

SIR,

HAving ſome time ago ſeen Mr. Pinchbeck's Model of a Wheel Crane, an idea occurred to me for making one to anſwer the ſame purpoſe, I preſume ſimpler and ſtronger. My deſign is, inſtead of a pair of bellows, to have a ball ſo connected to a ſmall horizontal Wheel, that, when the Machine moves too faſt, it may, by its centrifugal force, throw a ſtop upon the Wheel. A model of ſuch a Machine you will receive by the bearer, the conſtruction of which will be eaſily conceived without a deſcription of its ſeveral parts. Before the weight is permitted to deſcend, the hook muſt be drawn back as far as poſſible. In drawing up the weight, the ſmall wheel is not immediately diſcharged from the large one, which might cauſe the Machine to ſtop when not required; to prevent which inconvenience, the pieces of braſs round the Walking-wheel, which receive the hook, are made inclining, ſo that if the hook drops it does not hold the Wheel.

To regulate the force of the ball, move it higher or lower upon the braſs wire, by which it is ſuſpended.

If it appears to you a Machine of this kind would be of any utility, and you think proper to lay it before the gentlemen of the Committee, it will be a great favour conferred on,

Sir,

Your moſt obedient humble ſervant,

Samuel Bunce

Kirby Street, Hatton Street,
15th December, 1785.

Mr. More.

In the ſecond Volume of the Tranſactions, page 223, *may be found an Account of a Contrivance for preſerving Hay-Ricks from Rain during the making, for which the* Silver Medal *was voted to* Mr. RICHARD TOFT, *of* Kentiſh Town. *And it is with much Pleaſure the Society obſerve the Inſertion of that Account has induced the ingenious Writers of the two following Letters, to communicate their Thoughts on that Subject; which muſt be allowed of ſufficient Importance to merit the Attention of all Perſons who wiſh to preſerve ſo uſeful and valuable a Crop from thoſe Accidents of Mow-burning, and even firing, which in wet Seaſons, particularly, it is in imminent danger of, unleſs Care is taken to ſecure them from the falling Rains.*

The Thanks of the Society were given to the Rev. Mr. WARREN, *and to* Mr. AILWAY, *for theſe Communications, which without doubt will be attended with good Effects to the Publick.*

Pomphlet, near *Plymouth*,
June 3, 1785.

SIR,

IN the Monthly Review for January laſt, there is mention of a letter to the Society of Arts, &c. from Mr. Toft, of an ingenious contrivance to ſecure Hay Ricks from rain during the making: that the expence of the Machine, which will laſt ſeveral years, is about twenty-ſeven guineas. The expence ſtruck me, for the above is all I know of it, and I think alone ſufficient to prevent the general uſe of it.

I have many years amuſed myſelf with a farm; and as I live in a country ſubject to variable weather, from its proximity to the ſea, I thought of the method I am going to have the honour to lay before the Society, which fully anſwers the purpoſe above mentioned, at leſs than one fourth part of the expence, proportions conſidered; for I am quite unacquainted with the ſize of the Rick which Mr. Toft's Machine is calculated to cover. I ſhall therefore take the liberty to ſend you a deſcription of the whole of my method, though the covering of the Rick is the principal object in queſtion. I have ſcratched out a plan, by which you will ſoon diſcover that I am no great draftſman; yet, ſuch as it is, it may ſerve to make the verbal deſcription more intelligible.

The ſheet may be of very great uſe to Corn Mows which are finiſhed: as the they do not heat much, a very ſmall opening at top will be ſufficient for them. The ſheet reſting on the corn, and drawn tight, will throw off the rain, and very little affect it.

Three rows of ſtone wall, twenty inches thick, eighteen inches high, with intervals of four feet between the middle row and the two outward ones, ſo that the thickneſs of the three walls being built with ſtone, occupies five feet, which makes the whole of the width thirteen feet. The length of the three rows, is forty-two feet each. This length is for two Ricks to be made at different times; poles fourteen feet long, intermixed with ſhorter ones, are placed acroſs the three walls, projecting ſix inches beyond each outward one, in order to make the baſe of the Rick fourteen feet wide. Theſe poles are thinly covered with faggot wood, ſtraw, or any thing to prevent the Hay from falling between the poles, which, if placed pretty cloſe, are alone ſufficient. Thus a great deal of Hay is ſaved from injury by the moiſture it would attract from the ground in the common methods of ricking it.

A brick wall need not be ſo thick; and where poles, &c. are ſcarce, a fourth wall may be added; and thus ſhorter and ſmaller croſs poles, or old boards, will do.—

The length of the three walls, we have ſaid, is forty-two feet; but the baſe of the Rick occupies only twenty feet, and is fourteen in breadth by the poles projecting ſix inches each ſide. When the Rick is four * or five feet high, a ladder twenty-two feet long, at leaſt, is placed perpendicular quite in the middle, at the end of the wall, and reſts againſt the Hay. It is let into the ground, eight or nine inches, and

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* It may be done at firſt; but no one would begin a Rick of Hay, if it was likely to rain.

and rammed down tight. At the other end of the Rick, thus begun, a ſpar or pole, twenty-two feet long, and about fifteen inches in circumference at the bottom, is fixed in the ground to the ſame depth, as near the middle as the central wall will admit.—Then another ſpar or pole, twenty-four feet long, runs over the whole length of the Rick, being faſtened with a moderate-ſized rope to the ladder at one end, and to the ſpar at the other, high enough to prevent any obſtruction to the making the Rick. The croſs ſpar is raiſed or lowered in a few minutes; but it ſhould always be ſix feet above the ſurface of the Rick, when the covering is placed on it. This covering is a ſail-cloth ſheet, twenty-two feet long and twenty-four wide, ſewed together as the ſail of a Veſſel is. * The ladder and ſpars being already placed, and the ſail ſheet lying by, in caſe of a ſhower or the ſudden appearance of much rain, the ſheet is ſoon thrown over the

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* Old ſail cloth, if ſound, will laſt ſome years.

croſs ſpar, and deſcends fourteen or eighteen inches or more, according to the aſcending increaſed bulk of the Rick. To prevent its being blown from its place, and to keep it tight, that no folds may be in it, three ropes at leaſt, faſtened to eyelet holes on each ſide, deſcend to the ground two or three feet from the baſe of the Rick, and there are fixed with hooked ſtakes or to any heavy body, which may prevent the ſheet from blowing about: the ſheet thrown over the ſpar raiſed ſix feet from the ſurface of the Rick, leaves a ſufficient paſſage for the cool air to blow through, and carry off the ſteam ariſing from the hay. Should the rain beat much againſt either of the openings, the ſheet may be drawn cloſer, to prevent it.

The machinery, Sir, you perceive, is very ſimple, eaſily put together, and eaſily taken to pieces. A farmer is ſuppoſed to have one ladder at leaſt of the length required here; and if he has two, the croſs ſpar only need be purchaſed, ſince by beating out one of the ſteps of the ſecond ladder, and placing it over the middle wall, where two Ricks are to be made, it will anſwer the purpoſe as well as the ſpar: the price of the ſheet in this country, is ſix pounds fifteen ſhillings, and cannot be much more any where. It may be boiled with bark, as fiſhermen do their nets, or as the ſails of ſmall craft often are: it is a great preſervative of the canvas.

It may be uſed for a ſecond Rick, &c. or Corn mows the ſize of Ricks, or mows requiring more or leſs ſheeting: an additional ſeparate canvas, and a longer croſs ſpar or two, laſhed together, may be advantageouſly uſed: the only attention to make it laſt many years, is the putting it away dry. I would by no means adviſe the uſe of tar, or tar mixed with greaſe about it; it adds to its weight too much, and cracks it when cold; it will throw off the rain without it. This machinery is applicable only during the time the Rick is making up to the roof, be it a day or a month, either by hindrance from weather, or by waiting till more hay is made to increaſe the Rick to its intended bulk. When the roof is quite formed and well raked down, it cannot take any great damage; but even then the ſheet may be thrown over it a day or two, but not longer: the heating of the hay, which would be increaſed thereby, would gradually injure the canvas. The price of the ſpars is about eight or nine ſhillings. I am, with reſpect to the Society,

SIR,

Your moſt humble ſervant,

VINCENT WARREN.

Mr. MORE.

SIR,

BEING fully ſenſible of the patriotic views of the honourable Society for the Encouragement of Arts, &c. and their diſpoſition to judge favourably of any attempts to forward uſeful improvements, and being beſides impreſſed with gratitude for the advantage I have received from papers publiſhed under their patronage, I beg they will acccept the Model of a Cloth which I have uſed ſome years with great advantage, while making. Ricks of Hay and Corn. I very much regret I could not find a workman able enough to make it with elegance; and was merely deterred from offering it on that account, until hearing a contrivance of this kind had been approved of by the Society, and it being ſuggeſted in a critical review, that the expence would probably prevent its uſe.

I imagined that my contrivance, being more ſimple, and not half the coſt, might merit ſome attention; beſides, it would be ſtill cheaper, if half-worn canvas was uſed inſtead of new. My cloth was made by Mr. Welford, or Tower Dock; it contains one hundred and fifty-five yards of Engliſh Duck, at one ſhilling and ſixpence per yard: the blocks, cordage, &c. and making, in all, thirteen pounds two ſhillings and ſixpence. The carpenter's bill added, makes the whole expence, fourteen pounds five ſhillings, beſides the wheels. Under this cloth, I make Ricks containing thirty-five or forty loads of Hay. Mr. Welford obſerved his charge was ſomewhat more, on account of the novelty of the work; and indeed I gave him a good deal of trouble. The dimenſions of this cloth may be enlarged about one fourth, I think, with great propriety.

The method of uſing the cloth.

Two ſcaffold poles, twenty-eight feet long, (if ſix feet longer, it would be better) fix the poles in two Cart-wheels; one ſpade full or two of earth is dug up juſt to admit the nave of the Wheel into the ground: if, from the inequality of the ground, the rims of the Wheels do not apply, put under the hollows a brick, tile, or piece of wood, which will keep it ſufficiently ſteady.

Two ſtakes drove a foot into the ground on each ſide the uprights to which the ſtays are faſtened: the rings that ſuſpend the cloth, are of wood; the croſs piece, thirty-two feet long and ten inches round: the uprights being placed at their proper diſtance, paſs the croſs piece through the rings of the cloth; faſten the rope that comes from the pulley, at the top of the uprights to it: two ſmall blocks are faſtened to the under ſide of the croſs piece at each end, with two ſmall cords reeved in them; their uſe is to draw the cloth from or over the Rick, which will be facilitated by hoiſting one end of the croſs piece.

On beginning a Rick, hoiſt the cloth half up, and confine the croſs piece to the uprights, by a turn or two of a cord; during the work, draw the cloth over, and take care to pin down its edges in ſuch manner that the wing cannot get under it. If wind with rain ſets in at either end of the Rick, you may lay on a little ſtraw. When the Rick is ſo far advanced that the croſs piece is in the way of the workmen, it may be removed, either for another Rick, which is done in a very little time, or to be laid by. When you lay it up, take care it be dry; wrap it up with all its parts, and hang it up on ſome hook faſtened to a beam in the middle of a room, which will effectually preſerve it from Rats, &c.

I am, SIR,

Your very humble ſervant,

JOHN AILWAY.

Mr. MORE.

Some obſervations made by Mr. AILWAY, on deſtroying Inſects in Hot Houſes, and preventing the depredations of Vermin on ſeeds ſown, will make part of a future Volume of theſe Tranſactions; and the Model mentioned in the foregoing letter is preſerved in the Society's repoſitory.

The Thanks of the Society, and a SILVER MEDAL, *were preſented to Mr.* JOHN ADAMS, *Maſter of an Academy, at* Edmonton, Middleſex, *for his Invention of an artificial Horizon to be uſed on Land; and for his Communication of the ſame to the Public, by means of the following Letter and hiſtorical Account addreſſed by him to the Society.*

At the Committee to whom the Conſideration of Mr. ADAMS's *Invention, and the Merits of his artificial Horizon were referred, it was declared by Mr.* DOLLOND, *with that Candour and Liberality which have conſtantly formed parts of his Character, that although he had made many Inſtruments on the Principle laid down, yet the Honour of the original Improvement was certainly due to Mr.* ADAMS.

GENTLEMEN,

February 24, 1785.

GENTLEMEN,

PERMIT me to addreſs myſelf to you, the patrons of genius.

Few men can claim many uſeful inventions to their own ſhare; I have laboured to attain many, but have been too often unſucceſsful. One, I can claim as my own, viz. an artificial Horizon, the principles of which I communicated ſome years ago to Mr. Dollond, and am pleaſed to find that, through his care in the conſtruction, it is gotten into univerſal eſteem: all I wiſh is the honour of being recorded the inventor, in any manner conſiſtent with the plan of your Society. I ſhall be happy at any time to attend and make my claim; but flatter myſelf, that Mr. Dollond, who is one of your honourable Society, will be a ſufficient voucher for, GENTLEMEN,

Your obedient humble ſervant,

JOHN ADAMS.

To the Society of Arts, &c.

AN
HISTORICAL ACCOUNT
AND
DESCRIPTION
OF AN ARTIFICIAL
HORIZON,

For determining the apparent Altitudes of the Sun, Moon, *or a* Star, *to a great Exactneſs, on Land, with* HADLEY's Quadrant *or* Sextant; *by* JOHN ADAMS, *Teacher of the Mathematics at* Edmonton, Middleſex.

I HAD long been perſuaded in my own mind, that if a ſolid horizontal reflecting plane could be procured, it would obviate the difficulties and imperfections ariſing from the uſe of fluids for that purpoſe, ſuch as Water, Treacle, Quickſilver, &c.

About the year 1764, I purchaſed one of Siſſon's circular ſpirit levels, to which I cauſed three adjuſting ſcrews to be adapted; but the glaſs (a plano-concave) which covered the ſpirits, being the ſegment of a ſmall globe, I could never certainly determine with it the apparent altitude of an object within five or ſix minutes. Some time afterwards I had another glaſs fixed in the place of the former; the concave ſide of which was the ſegment of a globe, near thirty feet radius: with this I could certainly determine the altitude within three minutes, and found it very uſeful in windy weather, when my fluids, though covered with inclined glaſs planes, were liable to be agitated.

In the year 1778, a glaſs with parallel planes was adapted to my level, in lieu of the plano-concave; this alteration anſwered my moſt ſanguine expectations. I then communicated my improvement to Mr. Dollond, who has ſince made many of them, one of which is in my poſſeſſion, and anſwers my utmoſt expectations. I have had the pleaſure to hear from ſeveral gentlemen, who have uſed it in different parts of the world, the moſt flattering account of its utility.

In 1783, the inſtrument was known in ſeveral parts of Europe by the name of the Dollondonian Horizon, from the attention that gentleman had paid to the conſtruction of it, which was the cauſe of my writing the foregoing letter to the Society.

A particular deſcription of an inſtrument, ſo well known, and which may be ſeen in the hands of almoſt every practical aſtronomer,

nomer, ſeems needleſs; it being nothing more than a very ſhallow cylindrical braſs veſſel, with a glaſs cemented on the top, and three adjuſting ſcrews from the circumference, which ſerve for legs; alſo a ſmall hole in the bottom, or in the circumference, through which it may be filled nearly, with ſpirits or any fluid; which is kept in by a ſcrew adapted to the hole, ſo that the vacuity of fluid, or what the cylinder wants of being full, will be a bubble of air floating upon the fluid, againſt the lower ſurface of the glaſs: this bubble may be half the diameter of the cylinder, more or leſs; but leſs is better. In hot climates it may ſometimes be neceſſary to open the hole, and let part of the air which compoſes the bubble eſcape.

PRINCIPLE.

Granting that a piece of glaſs can be ground ſo as to have parallel planes; which is ſaid to be poſſible by all the workmen of whom I have enquired; then if the bubble be brought to reſt during a few ſeconds any where againſt the lower plane (which is not poliſhed quite bright), but the nearer the centre the better, the upper plane will be very nearly a perfect horizontal reflecting ſurface.

IMPERFECTION OF A PLANO-CONCAVE GLASS.

Some artificial horizons are ſtill made on this principle; but it is very improbable that the glaſs ſhould be put in ſo exact, that the upper part of the ſegment ſhal be in the centre of the reflecting plane: this may occaſion an error of two or three minutes. Again, ſuppoſing it juſtly cemented in, the eye cannot determine when the bubble is exactly in the centre, which, if not, the reflecting plane will be inclined ſome minutes from the parallel of the horizon.

There ſeemed to be nothing wanting to render this inſtrument univerſal on land but a portable inſtrument on Hadley's principle, that would meaſure a ſemicircle or 180 degrees; this circumſtance I happened to mention to Meſſrs. Gregory and Wright, who immediately preſented me with an improved Quadrant, by which the fore and back obſervations are equally facile and juſt: with this Quadrant and my Level, I determined the latitude of Southampton, Portſmouth, and Newport in the Iſle of Wight, each within a minute of the moſt accurate obſervations hitherto made, and that at the ſummer ſolſtice, when it was impoſſible to take the double of the Meridian Altitudes, by reflection with any Sextant.

METHOD OF USING THE ARTIFICIAL HORIZON.

Set the artificial horizon on a firm ſtone or wooden ſurface; then, by moving the adjuſting ſcrews, bring the bubble to reſt near the centre of the glaſs: if the bubble ſtand there five or ſix ſeconds without perceptible motion (and I have known it ſtand twice the number of minutes), be aſſured it is very nearly an horizontal plane; and the double apparent altitude may then be meaſured by it to leſs than half a minute; conſequently the apparent altitude within fifteen ſeconds; which is perhaps nearer than moſt portable Quadrants will determine an angle.

It will not be amiſs here to note that it is the attraction of the neareſt or moſt denſe ſide of the circumference of the horizon that draws the bubble from the centre; notwithſtanding which, the plane remains the ſame.

Now the horizon being adjuſted, take your Quadrant or Sextant in your hand, move backwards or forwards in a line of direction with the object, until you ſee it (ſuppoſe the Sun or Moon) reflected from the ſurface of the horizon to the eye; then with your Quadrant bring the object down, until the two neareſt edges touch, that is, the edge of the object ſeen in the Quadrant and the edge ſeen by reflection from the ſurface of the horizon: this will hold good, whether you obſerve with a Teleſcope adapted to the Quadrant which inverts the object, or with the naked eye. Half the angle thus meaſured by the Quadrant, or Sextant, will be the apparent altitude of the objects's lower limb.

EXAMPLE.

	°	′	″
Obſerved double Meridian Altitude of Sun's lower limb Jan. 28th, 1786.	40	8	0
Half	20	4	0
Refraction		2	34
Appt. Alt. LL	20	1	26
Semidiameter		16	17
True Alt. of centre	20	17	43
Zenith Diſtance	69	42	17
Declination South	18	4	11
Latitude North	51	38	6

This obſervation was taken near Edmonton Church, the latitude of which is 51° 37′ 58″ North.

But if the back obſervation of Wright's Quadrant, above mentioned, be uſed when the Altitude of the object is more than 45 degrees, what you read off from the Quadrant muſt be added to 90 degrees; then half the ſum will be the apparent Altitude of the lower limb.

SIR,

THE above you ſhould have had ſooner, but I have been extremely ill. I hope I have not intruded beyond the bounds of decency on your publication.

I am your humble ſervant,

JOHN ADAMS.

Mr. MORE.